IN THE SPECIFICATION

Page 4, line 13. Replace "region" with -- agent --.

Page 7, replace lines 21 and 22 with the following:

-- Adjusting the refractive index by adding a primary agent and making cross-links by adding a binding agent is known to those skilled in the art. A transparent flexible silicone gel material thereby is caused to undergo an additional reaction in a binding agent --.

line 25. Replace "region where" with -- agent which causes low -- . Replace "is low;" with --, --

Page 8, line 9. After "The" add --added--.
Replace "region" with --agent-.

line 12. Replace "region" with -- agent -.

line 16. Replace "region" with -- agent--.

Page 27, line 2. Replace "intimidate" with --intermediate--.

Copy of the above-noted pages with the amendments noted thereon is enclosed together with clean replacement pages carrying the amendments.

REMARKS

Claims 1 through 16 remain in this application and stand for examination. Claims 1, 7 and 10 have been amended to replace the word "region" with --agent--. Pages 4, 7, 8 and 14 of the specification have been amended to deal with the specific objections raised by the Examiner in the action. Claims 1 - 16 remain in this application and stand for examination. Reconsideration and reexamination are now requested in view of

today's amendments and the comments made hereafter.

Objection to oath/declaration under 37 C.F.R. 1.44.

The Examiner requires "proof of authority of the legal representative under 37 C.F.R. 1.44".

With respect and to the best of the understanding of the applicant, 37 C.F.R. 1.44 applies when the inventor is deceased or legally incapacitated. This is certainly not the case here. Accordingly, clarification by the Examiner on this point is requested.

Objection to the specification under 37 C.F.R. 1.125(a)

The Examiner objects to the specification as containing a dark line. Applicant agrees and, by today's paper, the earlier specification has been replaced in its entirety with the new specification enclosed herewith. The Examiner's attention is directed to the fact that the amendments made to the disclosure and the claims by today's amendments as set out above are incorporated in the replacement specification.

Objection to the specification under 37 C.F.R. 1.71

The Examiner refers to specific problems in connection with the disclosure. In particular, the Examiner objects to statements made on pages 4 and 7, paragraphs 3 and 4 of page 8, and the first paragraph of page 12.

Applicant believes that the problem with the specification arises throughout from the inappropriate use of the term "binding region" wherein the correct phrase should be --binding agent--. Applicant has attended to this correction caused by the idiom during translation in today's response and it is believed that the amendments made today should assist the Examiner substantially.

Rejection of the claims under 35 U.S.C. 112, first paragraph

The Examiner rejects claims 1 through 16 under 35 U.S.C. 112, first paragraph, for indefiniteness. The Examiner specifically refers to the methods outlined in claims 1 and 7 and the product set forth in claim 10. Again, claims 1, 7 and 10 inadvertently previously used the term "binding region" whereas the term --binding agent-- was intended and this has been corrected in today's response.

By today's paper, amendments have been made throughout the disclosure to substitute the correct term and phrases. With these substitutions, it is believed that the disclosure should now be considered as enabling and reconsideration by the Examiner is requested.

In view of the above, it is submitted that the application should be in condition for substantive examination on the merits. Action to that end and consideration of claims 1 through 16 are requested.

A confirmatory and identical copy of this response will also be forwarded by courier to the Examiner tomorrow.

Respectfully submitted,

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for producing such a gel.

It is further another object of the present invention to provide a low cross-linking-density gel which can stably suppress the diffusion of light by maintaining its working performance over a long period of time, and a method for producing such a gel.

DISCLOSURE OF THE INVENTION

In order to solve the aforementioned problems and accomplish the above objects, an inventive method for producing a low cross-linking-density gel, comprises:

a compounding step for adjusting a flexible silicone gel material to have a specified refractive index, and

a reaction step for causing the flexible silicone gel material adjusted in the compounding step to cross-link in a binding ~~region~~ agent where cross-linking density is low, thereby producing a low cross-linking-density gel.

In the inventive method, the specified refractive index is set substantially equal to the refractive index of cores of optical fibers to be connected.

In the inventive method, a polyorganosiloxane having vinyl groups at its ends is used as a primary agent of the flexible silicone gel material.

In the inventive method, a cross-linking agent is added in the reaction step.

In the inventive method, the polyorganosiloxane having covalently bound hydrogen atoms is added as the cross-linking agent.

In the inventive method, the compounding step and the reaction step are performed in a clean room.

Another inventive method for producing a low cross-linking-density gel,

The inventors of th present application studied the structures of various elastic materials and viscous materials during the development of a material which satisfies the above requirements and, in their study, directed their attentions to a macromolecule having a three-dimensional reticulated structure insoluble in a solvent and a gel structure which is a swollen material of such a macromolecule. Consequently, they established a compounding technique according to which a transparent flexible silicone gel material selected as a base material among synthetic gels was gelatinized at a low cross-linking density, thereby forming a low cross-linking-density gel (gel-fluid intermediate) which has a shape retaining property, which is a characteristic of a gelatinous elastic material, while having fluidity.

As a result of repeated devotion and efforts, the inventors completed a compounding technique for producing a low cross-linking-density gel which satisfies all of the aforementioned requirements and found out that this material was optimal as a material used for the connection of end faces of optical fibers. In other words, by merely providing the thus produced low cross-linking-density gel between the end faces of the optical fibers, a loss of light at the joint portion when light was transmitted from one optical fiber to the other could be effectively suppressed and conducting efficiency was remarkably improved.

In this invention, the low cross-linking-density gel is produced as follows. ~~A transparent flexible silicone gel material having a specified refractive index~~ ~~as~~ a primary agent is caused to undergo an addition reaction in a binding region where cross-linking density is low, with the result that the low cross-linking density gel having a viscosity and a minimum fluidity can be obtained. As a result of the addition reaction in the binding ~~region where~~ cross-linking density ~~is low,~~

free hydrogen atoms are advantageously absent sinc a total amount of active hydrogen atoms contribut to the reaction.

In the above addition reaction, a polyorganosiloxane containing covalently bound hydrogen atoms is added as a cross-linking agent to a polyorganosiloxane containing vinyl groups at its ends, which is a component of the primary agent, and cross-linking takes place in the presence of a platinum catalyst.

A range of the cross-linking density was specified by an amount of the cross-linking agent to be added, and a final cross-linking density could be substantially precisely controlled. The cross-linked binding ~~region~~ of the low cross-linking-density gel is in the range of 30% to 10% of the theoretical equivalent of the polyorganosiloxane containing covalently bound hydrogen atoms.

If the gel is produced beyond the above cross-linked binding ~~region~~, it displays properties more similar to those of an elastic material as the ratio of the cross-linking agent increases. As a result, the gel loses its fluidity and comes to possess a breakage point, which is not preferable. On the other hand, if the gel is produced below the above cross-linked binding ~~region~~, the primary agent which is not cross-linked has an increased degree of freedom. As a result, the gel becomes considerably fluid and creeping flow peculiar to silicone takes place, which are both not preferable.

The refractive index of the low cross-linking-density gel can be adjusted to a value substantially equal to those of various optical fibers by adjusting the refractive index of a transparent silicone oligomer as a primary agent in advance. Thus, a loss of light caused by the reflection and diffusion of light due to a difference in refractive index between the cores of the optical fibers to be connected and the low cross-linking-density gel can be suppressed to a minimum

Polished state of end faces of optical fibers	Transmittance when the end faces were merely brought into contact	Transmittance when the low cross-linking-density gel was used
Cut by a cutter	68.50 %	90.50 %
Polished by an abrasive cloth having a grain diameter of 0.03 mm	73.28 %	94.79 %
Polished by an abrasive cloth having a grain diameter of 0.012 mm	77.14 %	97.28 %
Polished by an abrasive cloth having a grain diameter of 0.003 mm	77.85 %	99.35 %

Concerning the properties, the low cross-linking-density gel is an aggregate which is an intermediate of an elastic material and liquid; is viscous despite its cross-linking structure of very low density; is freely deformable upon being pressurized; adheres to a pressurized material, and is restored to its original shape upon being released from pressure. This gel will not be softened or fluidized upon application of heat. Since this gel has no free hydrogen atoms as a binding site, it will not be chemically bound with the cores of the optical fibers and components of a cladding and is very unlikely to hinder the propagation of light.

As a result, the low cross-linking-density gel filled as the optical conductor at the joint portion of the optical fibers flattens the unevenness of the end faces of the optical fibers using coupling pressure, thereby reducing the reflection and diffusion of light to a considerably low level, and is stable over a long period of time without flowing out.